

Department of Agriculture, Trade and Consumer Protection

Division of Marketing

Agricultural Development & Diversification Program (ADD)

1998 Grant Project Final Report

Contract Number: 13108

Grant Project Title: Edible Foods Research Utilizing Extruded/Expelled Soybean Oil

Project Beginning Date: July 1998 Project End Date: July 1999

Amount of Funding Awarded: \$31,760

Name of Principal Contact Person: Roger Hillard, SoyCo L.L.C.

City, State and Zip Code: Adams, WI 53910

Submitted by: Roger Hillard Date: November 10, 1999

Department Contact: DATCP - Marketing - ADD Grants
PO Box 8911
Madison, WI 53708-8911
Tel: (608)224-5137
Fax: (608)224-5111

Wisconsin Department of Agriculture, ADD

**Grant #13108
Soy-Co LLC
Adams, WI 53934
ensoy@maqs.net**

Edible Foods Research Utilizing Extruded/Expelled Soybean Oil

It was the purpose of Grant #13108, conducted during July, 1998 to October, 1999, to:

- A.) Identify specific markets in Health, Bakery and Food Ingredient Industries which could utilize natural Extruded/Expelled Soybean Oil.
- B.) Determine which technical applications, product specifications and packaging technologies would be required.
- C.) Determine what market strategies are needed to access those buyers.
- D.) Determine, if any, which refining capabilities are required for those markets.
- E.) Evaluate and compare data to determine business feasibility for each product application and market

It was defined in the Grant proposal that:

Soy-Co LLC is a rural Wisconsin soybean processing facility in Adams, WI utilizing mechanical extrusion/expelling technology to derive value-added soybean products, and as a result, increase soybean premiums for local farmers.

Natural Food Industries are experiencing robust 25 % growth, and phytonutrients found in soybeans can be beneficial to consumers if properly marketed

Extruded / expelled soybean oil characteristics were known to include:

- high tocopherols, including vitamin E, which serve to inhibit the oxidation process in body tissues, protecting the body and prolonging an active life span by slowing the rate of oxidative destruction.
- high lecithin, representing a group of phospholipids important in cell structure and metabolism.

Background

This ADD grant as well as a preceding ADD grant, allowed SoyCo to shift from obvious soybean oil market applications such as fat additives for cattle and elk feed, or dust control for fertilizers, to industrial applications for use in rodent control and textiles, and less obvious but more profitable, food grade applications. It was the intention of this grant to explore food grade applications so management could plan a food grade facility.

SoyCo has struggled during the three years of operation, not in consistent quality production of high bypass protein for local cow herds, or in quality amounts of soybean oil production for local and national accounts, but rather in a limited economy of scale production facility, and in directional differences among farmer/non-farmer company ownership.

It became clear to SoyCo management that higher meal/oil production with the same labor was and is possible, and that a farmer- owner consensus was and remains essential to traversing difficult early stages of any modern rural AG business.

SoyCo Meal / Oil Sales

Wisconsin dairy professionals already had plenty of high by-pass protein including Soy Plus & Soy Best. Nutritionists in Wisconsin were not keen about changing their farmer's formula to a Wisconsin soybean product (SoyCo) unless there were nutritional and financial incentives. Please review: <http://pnpi.com/e2.htm> Jakush

Irvin Osterloh, President of Soy-Co during this phase, stressed the need to capture accounts which paid .30 cents per pound for our oil. At that time, during 1997, and the first quarter of 1998, much of Soy-Co's oil inventories were sold in tanker loads to solvent refining plants such as AC Humco, a division of Kraft Foods at .18 cents per pound.

These prices were and remain determined by CBOT/Chicago Board of Trade pricing, reflecting solvent soybean oil used in food grade and non food grade markets.

Clearly, the relationship between meal and oil production is important. The more meal produced and sold to area dairy and swine farmers, the more oil inventory accumulated.

If SoyCo could obtain consistent .12 cent premiums per pound on all of its oil sales, the earnings difference based upon oil inventories at the time would approximate \$143,000.00. This additional income would compensate low profits on meal sales. It was essential for SoyCo to develop additional markets for their oil. In all instances, oil premiums of .30 cents per pound would be necessary if SoyCo was to be profitable.

Solvent Derived Soybean Oil

Major refineries such as Honeymead, Cargill and ADM rely on vast production quotas to keep their production facilities running and markets supplied with soybean oil.

To accomplish this; a hexane derived separation process is utilized. As a result, all current inventories of oil and meal contain hexane traces, which compromise nutrient profiles of commercial soybeans, ultimately affecting the consumer in all market distributed soybean products. Please review: <http://pnpi.com/Hexane.htm>

Volumes of literature document current research suggesting natural processing and natural foods derived from those processes provide more nutrition and reduced risk to carcinogens. Please review: <http://pnpi.com/HumanNutritionalOverview.htm>

Natural Food Grade Soybean Oil

A focus upon food grade industries in Wisconsin seemed consistent with Wisconsin's heritage in production of milk, cheese, meat, poultry and fish for human markets. Wisconsin had developed a global awareness toward its natural and nutritious foods.

It was felt that Soy-Co oil was and is consistent with the Wisconsin tradition, farming soybeans and processing those crops in a safe and nutritional manner.

One needn't argue that natural pressed oil is nutritionally better, we know this is true. One can argue that natural pressed oil is inconsequential due to low production capacity worldwide.

Like a decentralized dairy production model similar to Wisconsin where a cloak of predominately small and medium size farmers dominate milk production levels year after year, it was believed at the beginning of this grant that the natural pressed soybean oil industry has the ability to decentralize and compartmentalize soybean traits, production and inventories, which can be manufactured, distributed and be consistently incorporated as a natural food ingredient. This grant allowed us to prove this assumption.

Grant Progress

- I. Strategies included developing a product name for the food grade oil and investigation and discussions with Federal, State and local authorities for procedures and criteria to produce food grade oil.
- II. Hired UW System (UW Madison & UW River Falls) and (MATC) food departments to conduct sensory analysis of specific bakery goods.
- III. Explored packaging and marketing applications.
- IV. Explored industrial parameters to produce food grade oil. Including: examining of efficiency production models and equipment which will allow larger oil production quantities and reduced operating costs.
- V. Experimented with stir fry recipes and cooking flavors.
- VI. Began development of a business plan for Soy-Co LLC which would include solicitation of a USDA Guaranteed Loan to build a food grade facility.
- VII. Hired nutritional experts and laboratories to examine our oil's nutritional values.

ADD Final Report

- 1) a. - Wisconsin Agriculture benefits from this research due to-
production of soybeans processed in mechanical process facilities throughout WI
Food grade oil sales and other valued added market creation, which create jobs and nutritional resource.
SoyCo is in the business of nutrition.

- Local farmers can be contracted to grow specific soybeans and receive premiums for those beans and value-added characteristics.

- Dairy and swine producers benefit nutritionally, experiencing more milk yield and more weight yield from better bypass protein, produced closer to their marketplace.

- Consumers benefit through access of nutritional oil and TVP / texturized vegetable protein and cereals formulated with oil byproducts, such as foots.

- b) - Adjustment of the grant's original objectives occurred by diverging resources dedicated to market research / CRC / Chamberlain Research Consultants - to scientific evaluation of production properties, as well as laboratory investigations of the oil.
- We could not complete a market survey of buyers of this unique soybean oil until we knew that we could duplicate this oil industry wide, and provide proof of its nutritional merits.
- To develop a market survey with answering these fundamental questions would have been ineffective and wasteful.
- 2) a. Grant funds assisted in hiring experts to evaluate our oil as well as to finance processing runs and administration of this research.
- b. Successes achieved through this grant include:

UW- River Falls- the most significant determination was that EFA (essential fatty acids), particularly linolenic acid (C18:3) are present in baked goods using our oil at higher levels (30%) than solvent food grade oil products. Linolenic acid is one of the omega-3 fatty acids, and studies are emerging which highlight this EFA (C18:3) as an important nutrient for maintaining good health, particularly in promoting good arterial health. Other evidence indicates importance to skin growth, learning ability and vision in young children. The amount of linolenic acid in one muffin prepared with SoyCo oil would come close to satisfying the total daily intact value for an adult female. See Stephan Ridley's report: "Food Applications For Expeller Processed Soybean Oils", Dec.1998.

- That a quick bread type containing SoyCo oil in place of shortening was acceptable with no significant difference in overall acceptability.
- That muffins prepared with 100% SoyCo oil revealed no significant differences in sweetness or intensity of flavor (lemon).
- Pizza crust, bread sticks and salad dressings were developed using SoyCo oil, with only slight differences noted, with panelist preferring the bread sticks as compared with commercial oil.
- In terms of overall acceptability. Muffins prepared with 100% SoyCo oil were judged as being equal to the Wesson control.
- In the judgement of the staff who prepared the muffins, there were no perceptible differences in other properties such as texture and color.
- No differences in total lipids (total fat, saturated fat, monounsaturated fat, polyunsaturated fat or trans fat).
- That there were no differences in palmitic, stearic or oleic fatty acids and only slightly higher linoleic (C18:2)
- In some instances, although the texture and color were very good or good, cake volume was reduced and taste was objectionable.

UW-Madison - that sensory evaluation of raisin-oatmeal muffins, when cooked with SoyCo's oil appeared to provide some superior sensory attributes compared to refined oil.

- That cooking a baked product reduces or completely removes beany flavor traditionally found in unrefined soybean oil.

FDA Federal Food & Drug Administration - contact and development of a Wisconsin standard related to this type of processing. Permission to proceed on a experimental basis to utilize oil in food grade applications. Development of a food grade component in a processing facility.

MATC Milwaukee Area Technical College - development of carrot cake and chiffon cakes utilizing our oil proved highly successful.

SoyCo LLC - learned that many baked or sauteed foods are as tasty or more tasty than commercial vegetable soybean oil.

- Experimentation with garlic ginger and garlic lemon food grade flavors added to the oil proved very compatible to stir fried chicken, onion, and vegetables.
- Experimentation of pizza crusts using 100% SoyCo oil, producing better elasticity in dough for stretching pizza and cutting bread sticks, saving production time. Additionally, 15 % less of the SoyCo oil was required Consumer response to the pizza taste, texture and golden brown crust was an unsolicited "yes"!
- Inventory of food grade containers, including one gallon, 35#, 30 gallon steel, and 2100 lb. Totes for use in shipping oil.
- Shipping of oil to Tombstone and TNT Crusts to verify their interest of a specialty crust.
- Process runs to determine quantitative and qualitative merits of extruder/ expeller oil.

Ed Jakush / Nutrition Expert

It is through PNP, Producer's Natural Processing that Ed Jakush became known to SoyCo as a new generation resource for this industry. Through his experience in food grade refining, knowing professional contacts in the field concerning vegetable oil processing, along with his background from MIT in nutrition and engineering, Mr. Jakush made significant contributions to this grant.

Almost immediately after contacting Mr. Jakush through recommendation by Mr. Leader at PNP late 1998, Jakush expressed a concern for quantitative and qualitative documentation in the natural press industry. His questions concerned determination of this non-intrusive and total non chemical process which could yield edible oil.

In a separate grant submitted to Wisconsin Soybean Board in early 1999, he specifically defined an investigation which would: explore under strict conditions practical ranges of seed processing and thermal/ mechanical filtering and deodorization utilizing state of the art equipment.

His objective was determination of the absolute minimum processes to create low-odor, edible and appealing soybean oil.

Complete chemical assays including protein, percent of oil, percent FFA, phosphorus, sterols; tocopherols, isoflavones, carbon-chain distribution and moisture were determined.

Data was assembled, charted and graphed to provide operational insights to trend lines and operational parameters.

A complete sample library of oil, along with this data has been established at SoyCo for future reference.

The results proved:

Commercial and specific cultivars produced higher oil content using our process.

That a wide latitude of temperatures, from 305 to 310 degrees, exists for operational freedom. [Important if you are pooling various processor's oil for resale.]

- Beneficial omega-3 fatty acid was present at approximately 8% in all samples.
- That natural degumming occurred to the oil and beneficiaries top oil in reducing hard fats (fully saturated palmitic and steric).
- That a natural level of residual lecithin is retained in the oil and is good for the product, as it allows better dough-conditioning properties in baking and self emulsifying properties in salad oil.
- That it contains choline, a valuable nutrient.
- That phytosterols were obtained at high levels, with an average of around 2,600 PPM (1/4%), or that one ounce is equivalent to contemporary supplemental levels in new CVD supplements and patented treatments.
- That key nutrient levels of Vitamin E family tocopherols were consistently present at 1,500-1,600 PPM, even after processing and deodorization. Commercial soybean contains virtually none of this.
- That we produce unusually low-odor, clear and pleasant tasting oils at deodorizing/vacuum stripper temperatures as low as 240 degrees.

Challenges faced: determination of food grade nutrition occurred at the end of this grant period rather than the beginning making it difficult to determine market strategy in contacting buyers. Non-food grade status makes it hard to market this oil at this time.

Literature is available through Dept of AG / ADD in the form of reports. No additional literature was created.

Presentations - No presentations occurred.

Media Outreach - Lake Winnebago Water Shed Project -, approximately fifty persons toured the SoyCo facility in July '99, and examined the process and products, including soybean oil. A follow up newspaper article appeared in the Adams Times serving Adams County residents.

Did grant meet original objectives? Why or Why not?

This grant exceeded the original objectives, by taking a leadership role in an industry-wide understanding of food grade pressed oil characteristics and capabilities.

We now know how to plan a food grade facility and what consumers can expect.

We also know what buyers and food scientists will get when they purchase or formulate this oil.

To use Jakush's words in summary: "It validates in-state opportunity to process the soybean crop to a high value-added status with only 1/10 the capital and none of the toxic pollution of a standard hexane extraction plant".

We fell short of our goal in accessing market demands and determining customer reactions to this data. We did not identify specific markets, nor market strategies to access those buyers who will utilize this type oil.

Describe any Ag products technologies or production levels. None

What did I learn and what conclusions can I draw from this grant? These studies for the university sector and technical prove without a doubt that Expelled Soybean Oil can be marketed to the consumer and will tell the consumer "buy me, 'cause I'm better for you, and at a similar price, why not choose better?"

How will this grant result affect our business? It is with this preparation that a significant food grade facility can be planned and market research can approach buyers of soybean oil.

How did it benefit the WI family farm? The family farm in WI is traditionally an independent entity with pride of producing wholesome nutrition for consumers. Natural E/E Soybean processing is new to the Wisconsin landscape and value added products are new. WI farmers will slowly realize benefits of higher soybean premiums and greater benefit / use of value added E/E products.

Further impact and future of WI farmers? More and more Wisconsin farmers will be impacted by the natural press industry. It is only through preliminary practical and research applications such as SoyCo has endeavored to carry forward that farmers around the state will earn more, directly or indirectly, from their efforts as growers of soybeans.

Through high tech and varied exploitation of natural soybean processing, WI farmers will grow more soybeans. They will do that because they make more money doing so.

How will ADD be able to utilize the information from this project? SoyCo's history serves producers everywhere as an leadership example through innovation of value added products derived from natural processing of locally grown soybeans.

ADD has three years of documentation regarding the SoyCo journey.

ADD nurtures and promotes an ideal, that a group of Wisconsin farmers can grow, harvest and develop value added products from Wisconsin agriculture. Wisconsin, consistent with its heritage, can be a leader in natural food ingredients.

A breakdown of soybean oil consumption shows that 44% is used for salad and cooking oil, 35% for baking and frying and 16% for margarine products.

Wisconsin has three natural soybean processing plants, no others exist. It needs more.

ADM states publicly and often that their goal is "providing a supermarket to the world". Their published goal is 'continued development of new products and processes which increase the demand of the crops which they control'. I see similar goals with the SoyCo initiative.

The extruder/expeller process is evolving. Production processing capability has increased tenfold. The time to develop bigger and faster is now.

The WI Department of Agriculture/ ADD has and needs to continue to promote this industry.

Future projects and other research could include:

- a project presentation from Ed Jakush - (separate paper submit).
- Further recipe development with possible modified recipes using E/E oil for market applications in the health food sector.
- Continuation of SoyCo business plan, including a food grade plant and aggressive meal discounts / sale commissions for meal traders.
- Chamberlain Research consultant work with Ed Jakush to develop market survey of specific pizza vegetable oil buyers and natural stir fry bottling.
- Future studies could include shelf life of open and sealed containers/ wt fatty acid profile.

In conclusion, I would like to incorporate a study that four UW seniors voluntarily did for SoyCo at the request of Mary Hanneman from CRC in Madison. Mary had approached her friend and past professor in marketing explaining our focus using natural soybean oil.

These students highlighted their concerns as they researched the marketplace:

- hire at least one full time sales associate to pursue the industrial cooking oil strategy.
- budget large amounts of money to increase consumer awareness of the value added health benefits.
- focus on hospitals and schools, once the oil has been tried by local hospitals and schools, SoyCo can use their testimonies to promote sales.
- incorporate personal face-to-face selling.
- design a industrial label with logo icon which the consumer recognizes as cold pressed and nutritious.

This oil could sell in the marketplace at between .35 cents and .42 cents per pound.

Currently, SoyCo produces about 230 pounds of oil per hour with an eight hour day of production. That is about 1840 lbs. per day and 9200 lbs. per week. At the end of a year, 478,400 pounds of oil would have been produced. If one calculated this amount times .30 cents, \$143,520.00 would have been earned.

To suggest other factors such as oil production from double or triple shifts, using Insta-Pro 9600's, replacing current IP 2500 machines. As meal quotas increase, and food grade refining capabilities mature, it is now possible to take the next step in planning a food grade facility and plugging in more profit orientated scenarios.

MEMORANDUM

Date: October 14, 1999

To: Wisconsin Dept of Agriculture
Wisconsin Soybean Board

From: Edward A. Jakush / SoyCo L.L.C. (Adams, WI)

Subject: **Extruded/Expelled Soybean Oil in Meal - Project Wrap-Up**

1. Research required to further this activity:

The natural expelled oil, its unique quality and nutrient level, and its edible flavor, have been the real focus so far. The surprising level of success we achieved in the July-through-September trials suggests the following:

- a. Enclose the hot FFM out of the extruder and blanket it in its conveyor, as well as inside the press, with nitrogen, CO₂... (no air). This will improve flavor and preserve nutrients, as well as maintain a much more enclosed and sanitary operation.
- b. Inject 1% to 2% water (with or without food-grade citric or lactic acid) to the FFM, and also to the hot oil. This should augment the natural separation of the gums. If it doesn't, then the original, simple system (relying upon the natural 11% to 12% water in the bean) is adequate.
- c. Store all final-press oil under nitrogen to preserve flavor.
- d. Run vacuum strips of hot, fresh-press oil (crude) at conditions much milder than in conventional deodorizers (as we have already shown works) - typically, 1.0 mm at 220-280°F or 25.0 mm (1 inch of vacuum, easy) at 260-320°F. This should be done both on the normal, standard oil (air-exposed), as well as the new, nitrogen-blanketed oil. Flavors and odors should then be immediately compared. This is the key step to making direct, edible, consumer-friendly oil..
- e. Use the production and QA data to start a cost/engineering estimate on a module plant for serious, 24-hour production of direct, consumer-ready, edible soybean oil (all natural, high in vitamins and sterols), and the related natural "44/7" press meal. Include options for dehulling, for the future upgrading of the meal into a direct feed for human-edible, textured vegetable-protein product. Each module, based on no.9600 extruder (and two no.4500 presses) would run 125 bushels per hour, or about 900,000 bushels per year (with 7 million pounds per year of edible oil).
- f. Do much tighter quantification on the "foots" (natural gums) which settle out. Determine the best way to separate and densify them. Provide adequate quantities for nutritional-supplement feeding studies for health data - they consistently show very dramatic cholesterol-lowering effects.
- g. Since the natural meal has been shown to run at least ¼% of pure, natural isoflavone, and only two rounded tablespoons equals the health-food industry's recommended daily level (so mg), the meal should be isolated in a food-grade status and also included in natural human nutrition feeding studies. If looked at as only a commercial "daily isoflavone nutritional supplement," the 20 grams of meal (easily eaten as a cooked breakfast cereal) are worth about 50 cents to the consumer (typically 30 pills for \$15). At 2.5 cents per gram (\$25 per kg), or about \$22,725 per normal ton, as standard 44/7 meal (typically \$180 per ton). It can also be re-extruded into a meat-like TVP product, *for* cutlets, veggie burgers, etc.

2. Immediate value of this project:

In a short period of time, using simple, standard, commercial production equipment, and some very good outside laboratories, we accomplished a significant amount:

- a. We have proven that the operating conditions of virtually all the extruder/expeller processors are safe and forgiving. By pushing the system to its extremes on temperature and pressure, and observing virtually no change in nutritional profiles or yields, we finally established this - until now, people had only guessed at it. This allows a much greater safety factor in future scale-ups and plant design.
 - b. We proved that, with very mild mechanical/thermal vacuum stripping, the natural oil can be made relatively odorless mild and appealing for direct consumer use. This is extremely unusual, as the conditions used have never been done before in the edible-oil trade. No chemicals were required, nor are they needed. This allows a whole new category of highly nutritious oil, directly produced at the small processor facility.
 - c. We proved that not only can the foots be densified to their natural equilibrium standard (about 40% phospholipid), but we showed that a centrifuge does this readily. Since each 1,000 bushels of raw soybeans contains about 400 pounds of these foots, and they are potentially worth at least \$2 per pound, simply as “natural lecithin” (and possibly much more), this could easily be another 80-cent per bushel return on the soybean.
 - d. The nutritional value of all the fractions is high to very high: the oil has excellent levels of valuable phytosterols, choline, phosphatides (lecithin), tocopherols (vitamin E family of antioxidants), critical omega-3 fatty acids (8%), and isoflavones. *Note:* the isoflavones correlate closely with dramatic reductions in breast and prostate cancer, and osteoporosis and heart disease.
 - e. We now have a much more clear idea of the sort of engineering and plant design required to create a self-sustaining, profitable, 24-hour/day operation.
3. The value of a bushel of soybeans by extrusion/expelling and its products, compared to standard hexane-extracted commercial material:

	Standard Hexane Extracted - At CBOT	Average E/E Press Oil/Meal - At CBOT	Average E/E Press Oil/Meal - At Usual Premiums
OIL	11.1 lb.(crude) \$1.865	8.0 lb. (w/foots) \$1.344	8.0 lb. (30¢/lb.) \$2.40
MEAL	47.6 lb. (12% H ₂ O) 3.737	51.0 lb. (12% H ₂ O) 4.004	51.0 lb. (\$30+/T) 4.77
NET	\$5.602	\$5.348	\$ 7.17
CRUSH	- 5.08	- 5.08	- 5.08
MARGIN	~ \$0.52 CM	~ \$0.27 CM	\$2.09 CM
	[Barely acceptable to large operators]	[This is a non-sustainable loss, as overhead alone runs over \$1.10/bu.]	[This modest specialty pricing supports steady E/E production and earns well]
Mid-October, 1999 3-Month Running Average (Chicago Board) were: Oil: 16.8¢/lb. Meal: \$157/Ton Beans: \$5.08/Bushel			The proven quality in this program readily supports these necessary premiums.

E² (E/E: Extrusion/Expelling)

The recent reintroduction of this 70-year-old technology, unfortunately abandoned to world-scale, solvent-extraction oil-seed plants, is the timely result of many significant advances in machine and metals technology. Contemporary alloys, motors, drive systems, instrumentation and controls, machine tolerances, etc., have allowed this significantly superior method of processing soybeans (as well as flax, sunflower and cottonseed) to reemerge in the animal feed marketplace. The past several years, nationwide, have shown tantalizing data on dramatic improvements in overall animal health, feed conversion ratios, etc.

The extruder is uniquely capable of cooking, expanding, sterilizing, partially dehydrating, stabilizing and texturing a wide range of grains. The final temperatures achieved - solely through mechanical action - are well in excess of those realistically obtained in any solvent-extraction facility. Hence, far more specific control of bypass protein and specific inhibition of anti-nutritional enzymes and other factors. There is absolutely no use of any external agents or chemicals the extruder output is totally natural, pure and unadulterated. By leaving up to one-third of the original oil-soluble fraction in the meal, a great many valuable phytonutrients are retained, in their original cellular matrix. This is always metabolically superior to any simple "post-addition."

Established, known and widely-proven benefits include the following:

1. Uniquely high digestibility of proteins and amino acids (>90%).
2. High value of metabolizable energy (4,180 KCal/Kg vs. NRQ value of 3,000 KCal).
3. Stability and freshness, due to the high level of natural tocopherols (110 to 120 PPM of this Vitamin E family).
4. The natural tocopherols often offset, and exceed the target artificial vitamin E supplementation in feeds (a 5-pound daily ration contains about 250 mg of the tocopherols).
5. A simple (and proven biologically superior) method of adding fat to diets (traditional feed-mill post-addition of generic fat causes microflora problems). The E/E feeds contain the fats internally, in the original cell matrix.
6. Very low in anti-nutritional factors and anti-genic activity of the soy protein commonly associated with solvent-extracted meals (consequence of the 300⁰F process).
7. High in lecithin, a phospholipid critical to fat metabolism.
8. Very high in choline (as the phospholipid), which has demonstrated significant effect in liver and brain health in herds. This is unique.
9. Highly palatable: animal response is immediate; no resistance, but rather eagerness. We even eat it, with its nutty, rich flavor - its appeal is obvious.
10. Excellent flowability in bulk bins and feeders - this is due to the low level of residual water and the bonded, granular nature of the meal.
11. Greatly reduced feed-generated dust - again, due to the unique granular structure.
12. Excellent long-term storage stability from moisture problems, due to the designed 30% reduction in original moisture content.

13. A "7% feed bonus," as a consequence of the 50% reduction in original bean moisture. The E/E meal is approximately 94% active solids, versus 88% in solvent-extracted meal.
14. The cell rupture, shaping and texturization give a unique "prechewed" result, yielding significant improvements in digestibility.
15. Sterilization is superior to any other method, again due to the high process temperature complete bacterial, viral; mold and yeast destruction.

In practical terms, the above factors contribute to widely-documented cost/performance ratios of 5/1 to 20/1 This means that for every \$1 premium spent on the natural meal, \$5 to \$20 are immediately (and unambiguously) returned the customer. Improvements in feed conversion, average daily gain and, egg production, and dramatic improvements in milk production, are all well-documented. A longer term value - reduction in morbidity/mortality -also is routinely observed. The toxic effects of solvent-extracted meal on pullets, chicks and baby piglets is well-known - the E/E meal, on the contrary, allows them all to thrive.

ANTI GRAVITY

Taste Matters

If we are indeed what we eat, then Americans can rest assured that they actually have something that some commentators have often doubted: good taste. According to a study published in the October 1998 *Journal of the American Dietetic Association*, taste is the primary factor that motivates ¹ peoples choices of what to stick in their pieholes. Previous studies have also revealed that most of us prefer the delectable comestible over the foul-tasting dining experience. As the authors sum up "People are most likely to consume foods that they evaluate as tasty." I know, I know, you're shocked – shocked! But the study does have a serious message about what we eat and how perhaps to modify those choices better.

The researchers examined four variables in addition to taste - nutrition, cost convenience and weight-control concerns. They also noted the subjects other health behaviors, such as exercise patterns, smoking and drinking, and looked at how all those affected food choices. The almost 3000 subjects were classified according to their overall health profiles. Some of these groupings, seven in all, received alliterative appellations by the resourceful researchers.

For example one group was labeled the "physical fantastics." They were the most health oriented individuals, who don't smoke, don't drink much, eat healthfully, exercise routinely and watch their weight. In short they can still get into the pants they wore in college. Another group the "active attractives," have some interest in their overall health but mostly because of a concern with their looks. They tend not to smoke, but they do like to experience firsthand the effects of ethanol. They mean to work out, eat right and keep their weight down; but they're not quite doing it. In other words, they still have their college pants, but they're in the bottom drawer. The "decent dolittles" don't smoke or drink, but they don't exercise or eat healthfully. Their college pants have been taken out more than they have. Finally, the "non-interested nihilists" smoke, eat anything and don't exercise. Their college pants can be heard on any staircase at the college.

The bottom line: all the groups rated taste as being the most important factor in food choice. As the authors point out, "Taste therefore, can be considered a minimal standard for food consumption." The other factors, however, varied widely depending on which group you looked at. Nutrition and weight control were almost as important as taste for physical fantastics but far less important for non-interested nihilists and even active attractives.²

With all these data in hand, the authors make what seems to be quite a reasonable suggestion. Health experts are always trying to get people to eat better in this country, but do it by harping on the nutritional value to be found in those wholesome foods. Basically, can that idea right along with any vegetables you want to see again in the spring.

"A more promising strategy," they write, "might be to stress the good taste of healthful foods." After all if Madison Avenue can still figure out ways to convince millions of Americans that smoking is charming, they can probably come up with a plan to make us crave vegetables. Picture the ad campaign: "Brussels sprouts. Not as bad as you remember them." Or maybe: "Broccoli. Not as bad as Brussel sprouts." Well, they might want to start by comparing apple's and oranges.

-Steve Mirsky

Additional Comments by Ed Jakush

- 1 Good taste, very low odor were main goals of this work. We succeed beyond expectation.
- 2 This is a powerful warning on naïve marketing for "health."